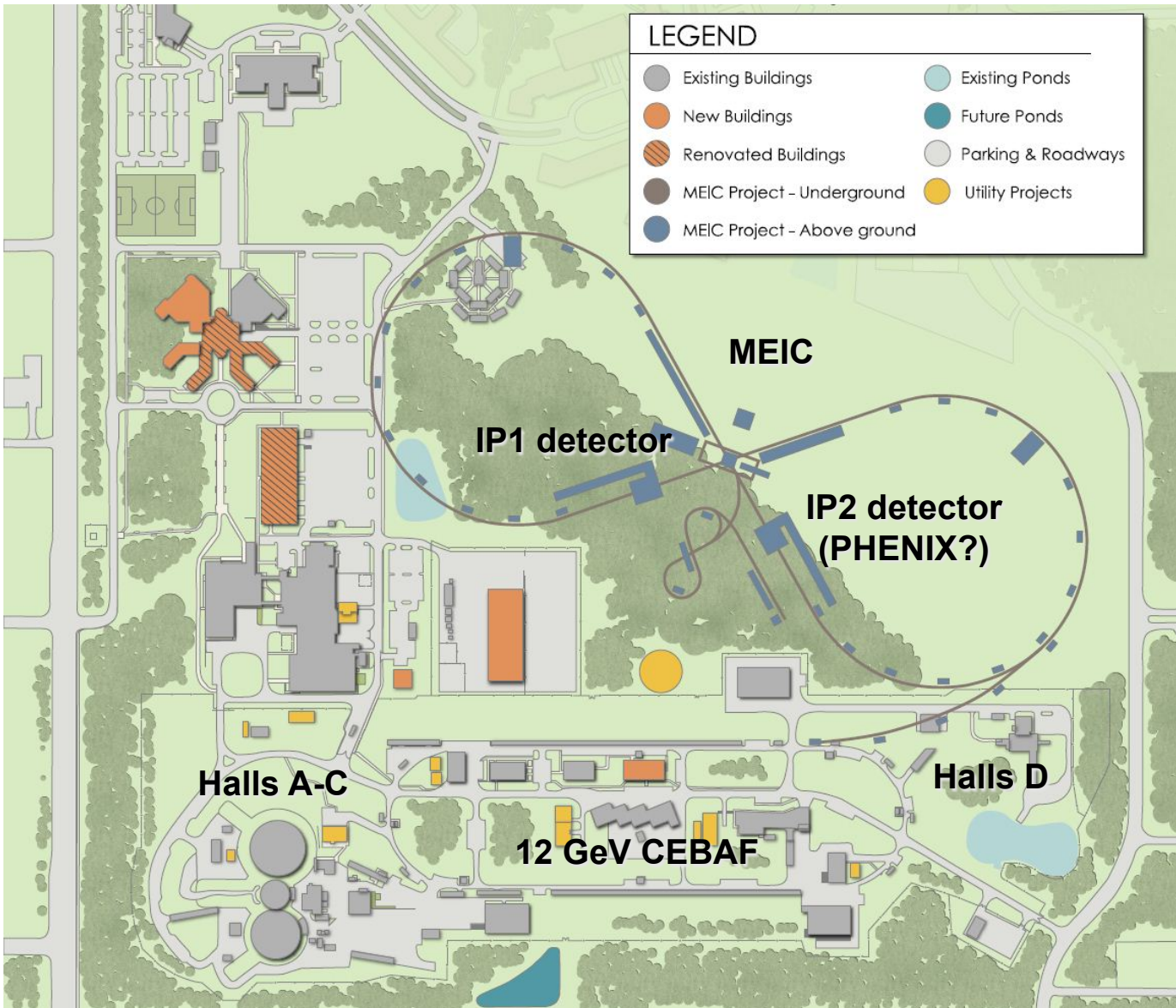


PHENIX at the MEIC?

MEIC layout at the JLab site



~2.2 km circumference

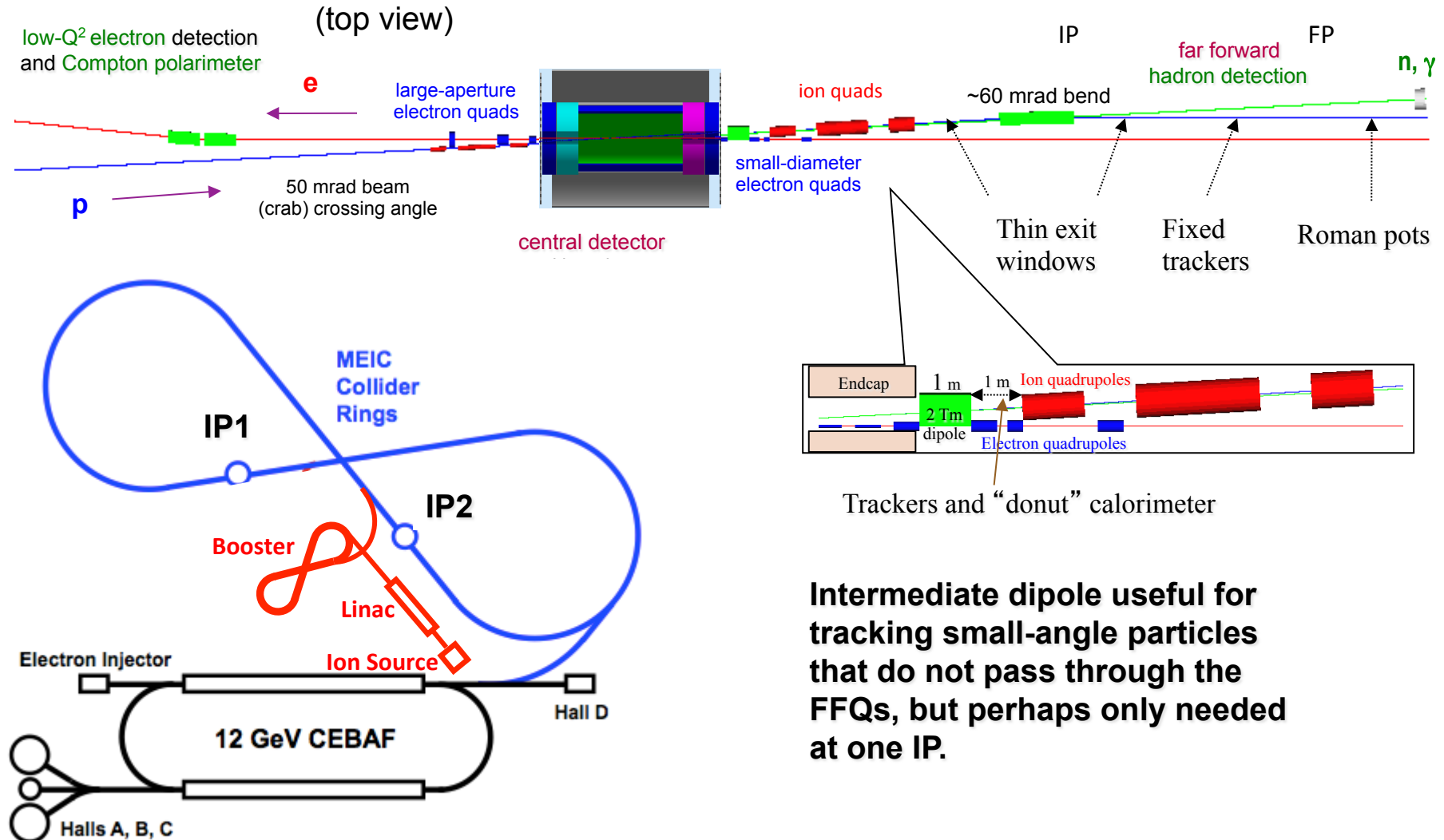
Electron ring from SLAC
(PEP-II)

2 interaction regions

12 GeV CEBAF used as
injector

Fixed target
infrastructure (including
detectors) would remain

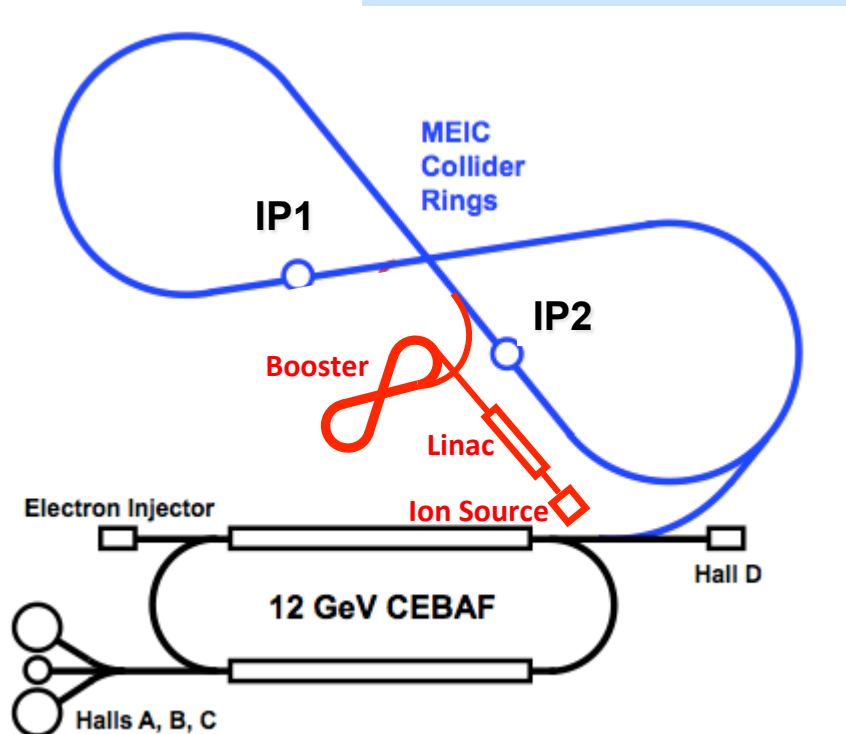
MEIC-IP1 interaction region



ePHENIX dropped into IP1

Compton polarimeter
and Low-Q2 tagger
chicane (~25 m)

- Not ideal since forward HCAL not compatible with first dipole
- Could work for sPHENIX with a different endcap design

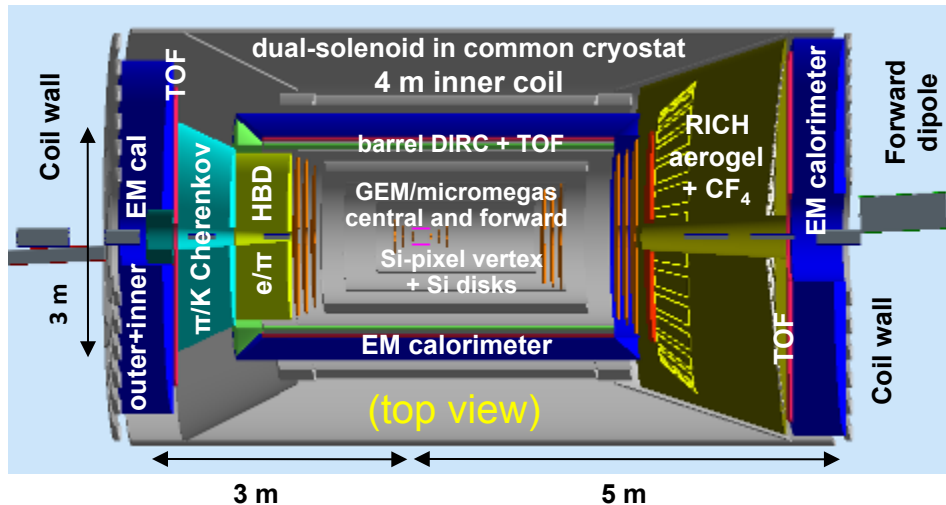


- But IP2 can be optimized as desired!

Forward ion detection

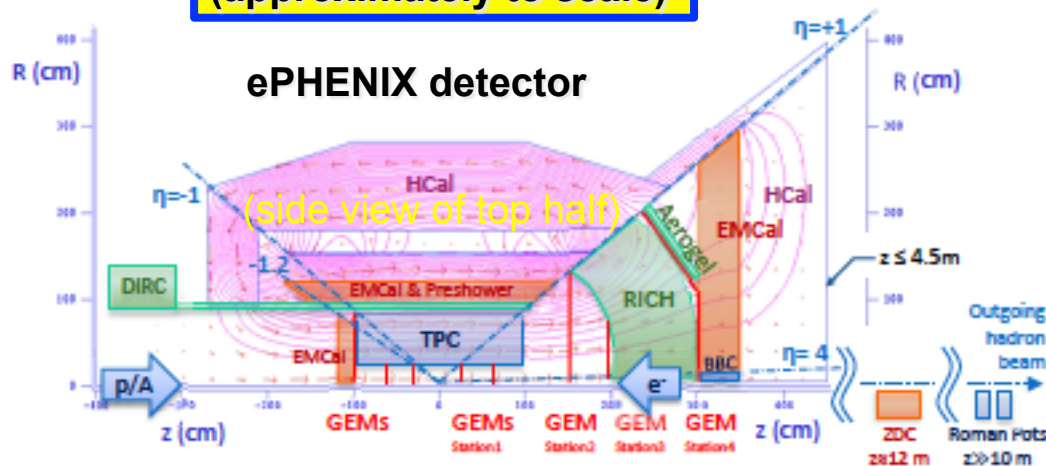
MEIC-IP1 and ePHENIX detectors

MEIC-IP1 detector



(approximately to scale)

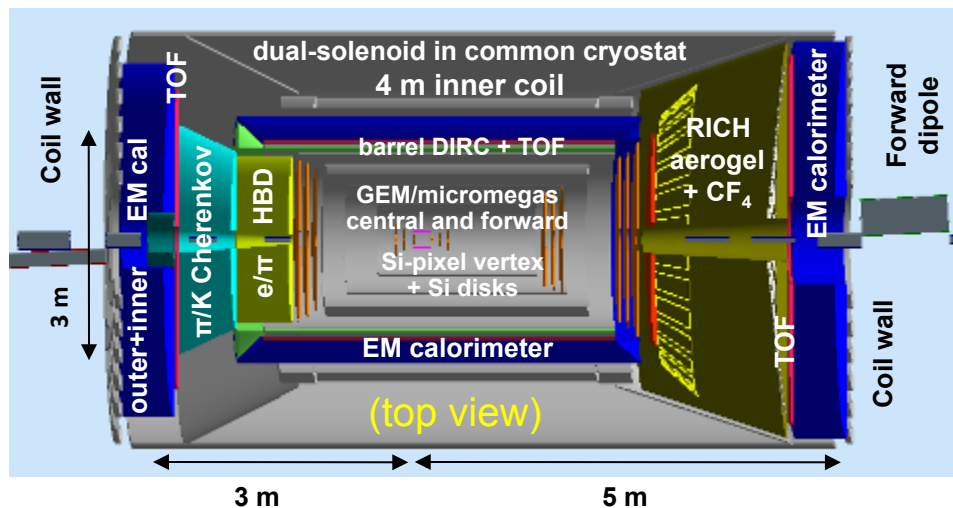
ePHENIX detector



- The central detector concepts developed at JLab (MEIC-IP1) and BNL (ePHENIX) are generally similar, but offer complementary capabilities
 - Central tracker technologies
 - Endcap Cherenkov detectors
 - HCal location and coverage
 - Forward dipole in front of FFQs
- **MEIC-IP1 detector**
 - Focus: SIDIS and exclusive
 - Forward HCal optional (integrated with dipole?)
 - Lots of space for PID
- **ePHENIX**
 - Focus on jet-physics
 - Good HCal coverage
 - No intermediate tracker
 - Asymmetric endcaps possible/desirable?

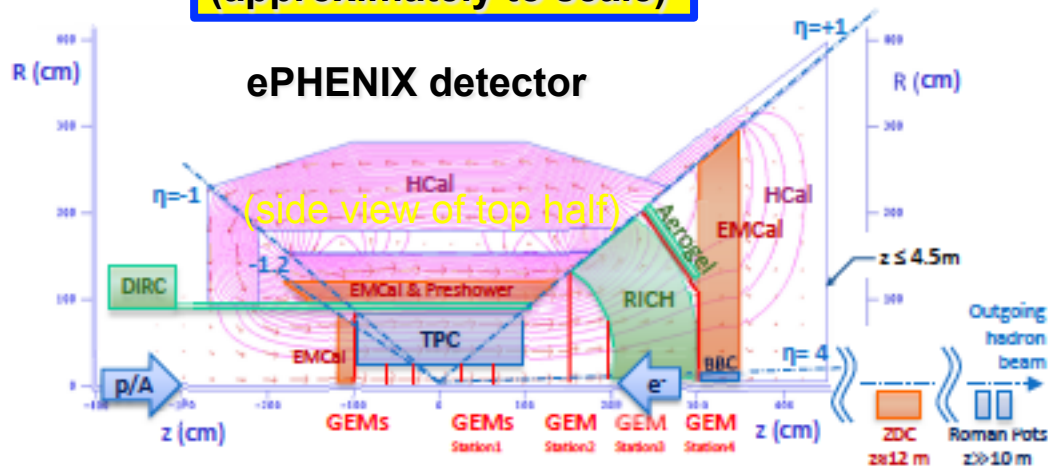
MEIC-IP1 and ePHENIX detectors

MEIC-IP1 detector



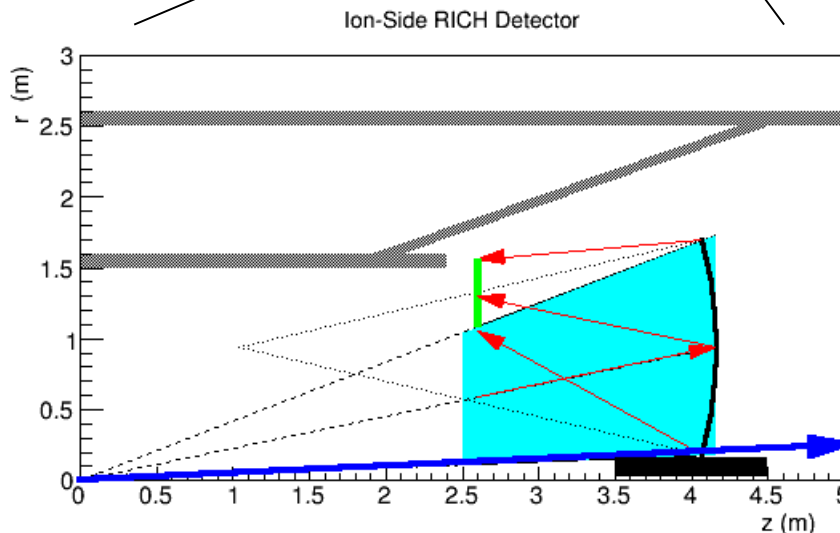
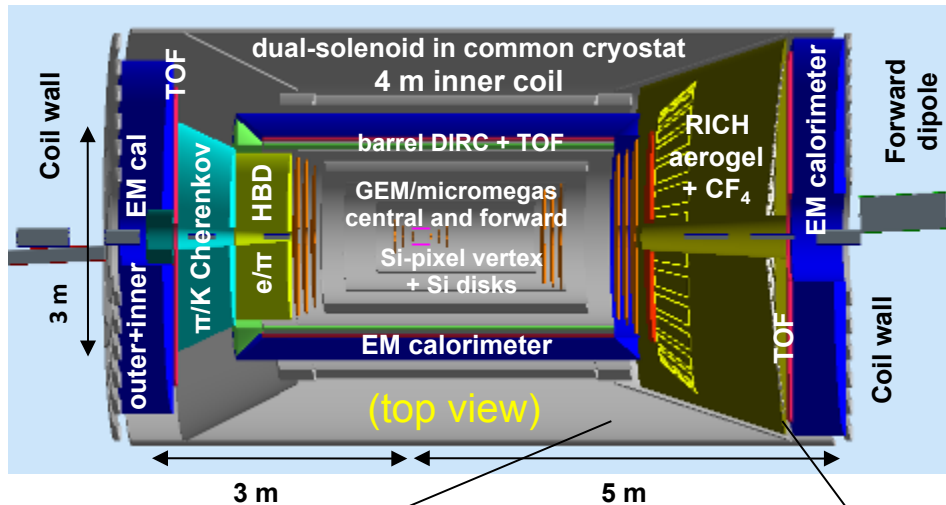
(approximately to scale)

ePHENIX detector



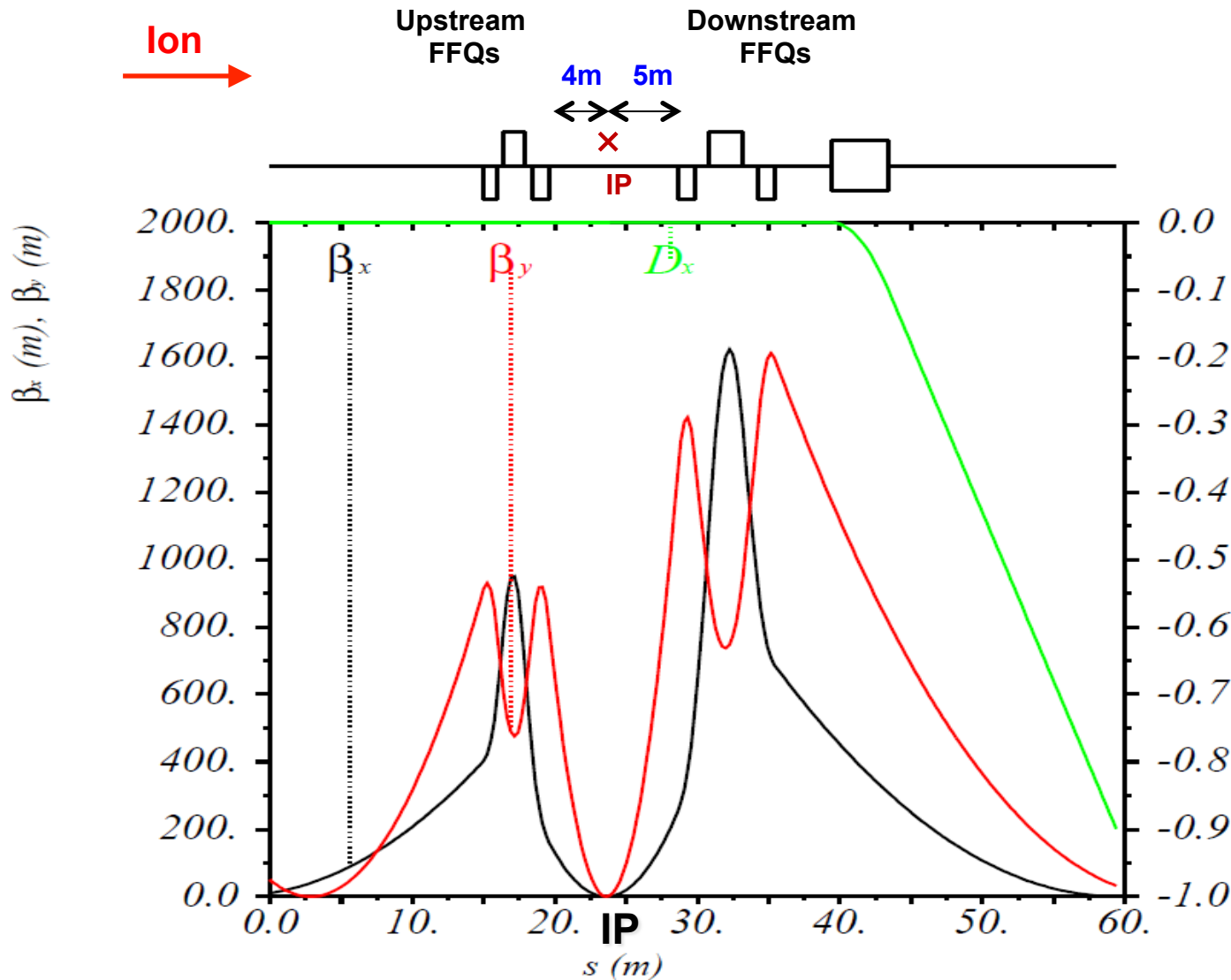
- The MEIC-IP1 detector is designed around an identical solenoid as sPHENIX (4 m long, 3 m diameter)
 - CLEO solenoid or new magnet
- The IP location is doubly asymmetric
 - Inside the coil (1.6 m + 2.4 m)
 - Endcaps (1.4 m and 2.6 m)
 - HCal could go outside of forward ion dipole (first ion FFQ is 7 m from IP)
- Luminosity scales linearly with total distance between ion FFQs – but the IP does not have to be in the middle!
- ePHENIX at eRHIC has a doubly symmetric location
 - IP in the middle of coil (2+2 m)
 - Both FFQs are located 4.5 m away
- Easy to keep former but adjust latter!
 - Suggestion: use 4 + 5 m distance!
 - More space for ion-side encap!

Endcap PID



- The initial stage of the MEIC will not post-accelerate electrons from CEBAF giving a 12 GeV max energy.
- A relatively inexpensive **threshold Cherenkov** can provide π/K separation up to 9 GeV on the electron endcap.
 - Would also work at eRHIC
- EM calorimetry in electron endcap follows the proved formula from CLAS with an inner crystal calorimeter and a cheaper outer one.
- More space on the ion side allows for a **dual-radiator RICH**, conceptually similar to the one at LHCb, with mirrors in the shadow of the barrel detectors.

ePHENIX@IP2 ion optics



- Luminosity is proportional to the total distance between FFQs

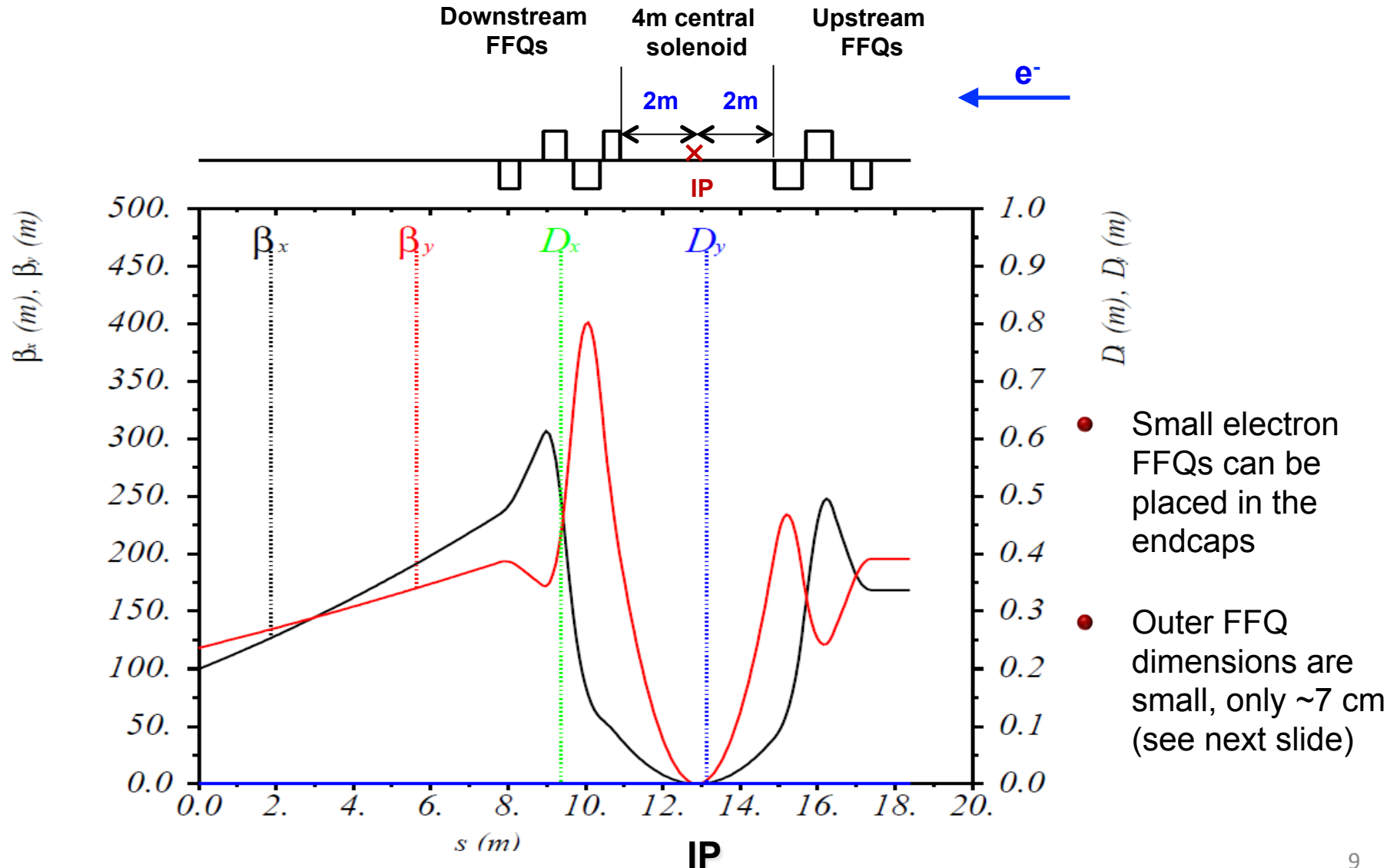
- FFQ gradients are proportional to the $1/\text{distance to the IP}$

- FFQ peak fields are gradient \times aperture
 - Large aperture only needed downstream

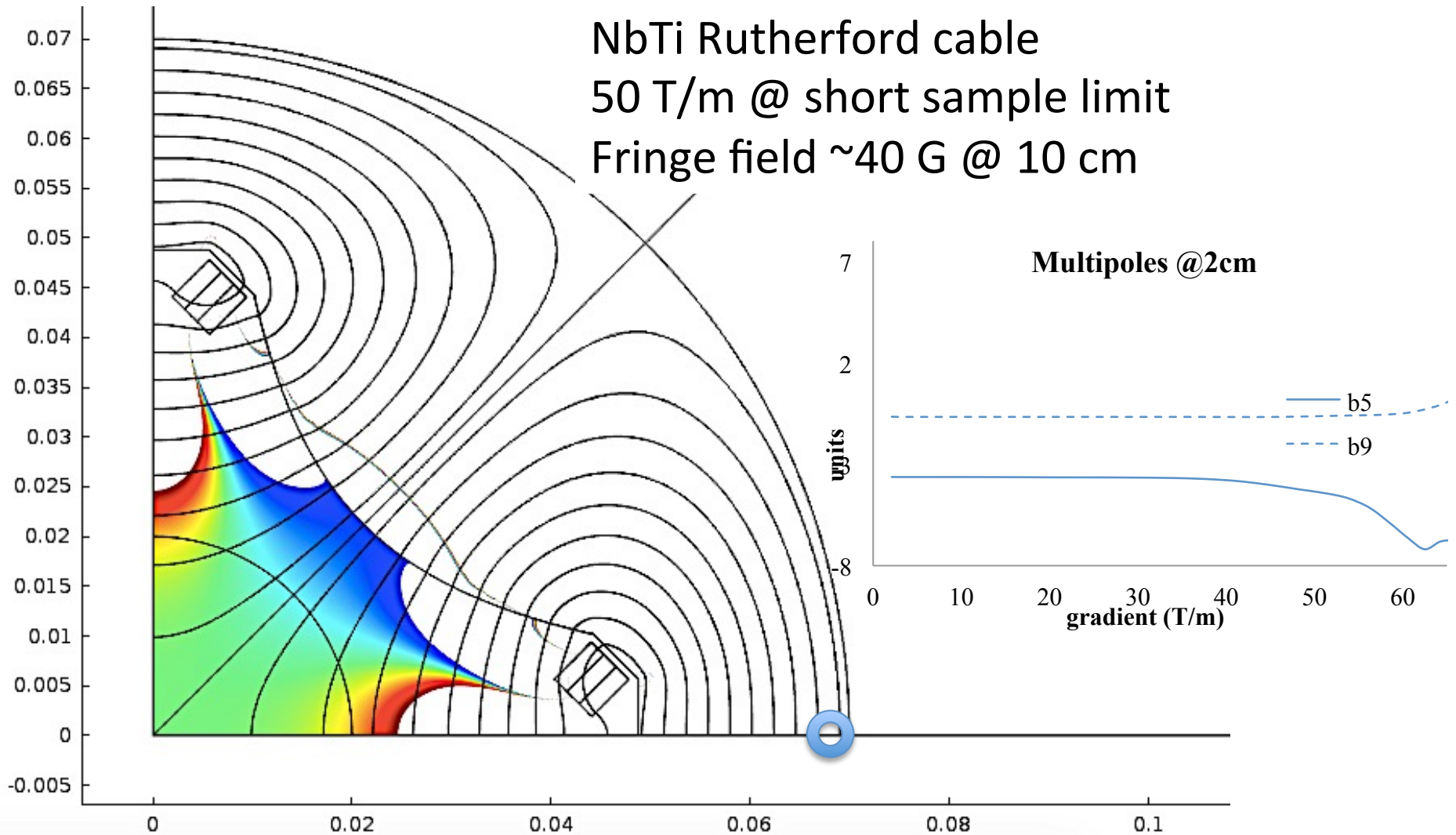
- Asymmetric endcaps generally make life a little easier...

- Crossing angle: can be up to 50 mrad

ePHENIX@IP2 electron optics



Small-diameter electron quad

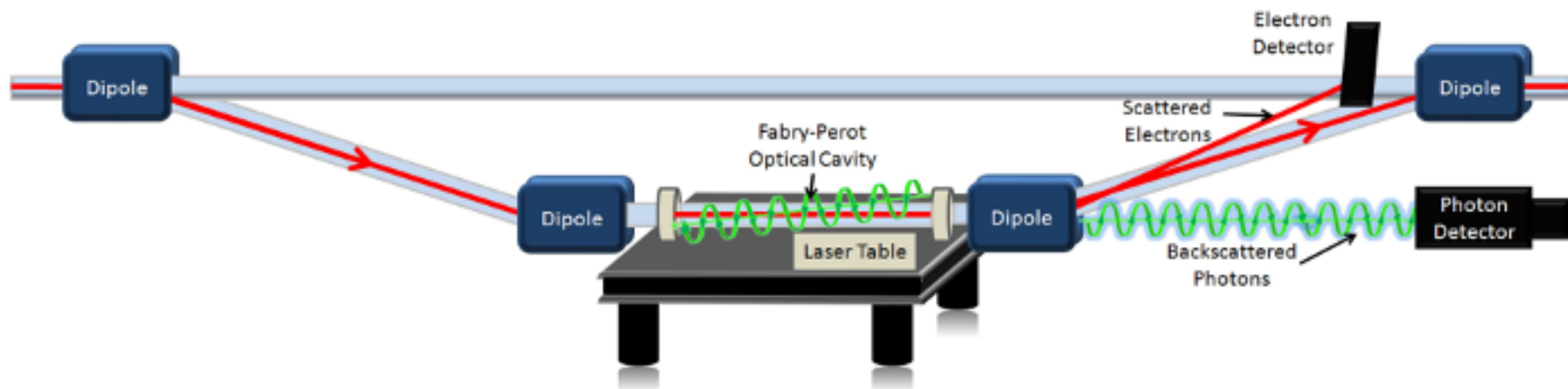


1. Could use MgB_2 windings ~same gradient, operating at 10K.
2. Could incorporate an active shield winding to kill fringe field @ e-beam

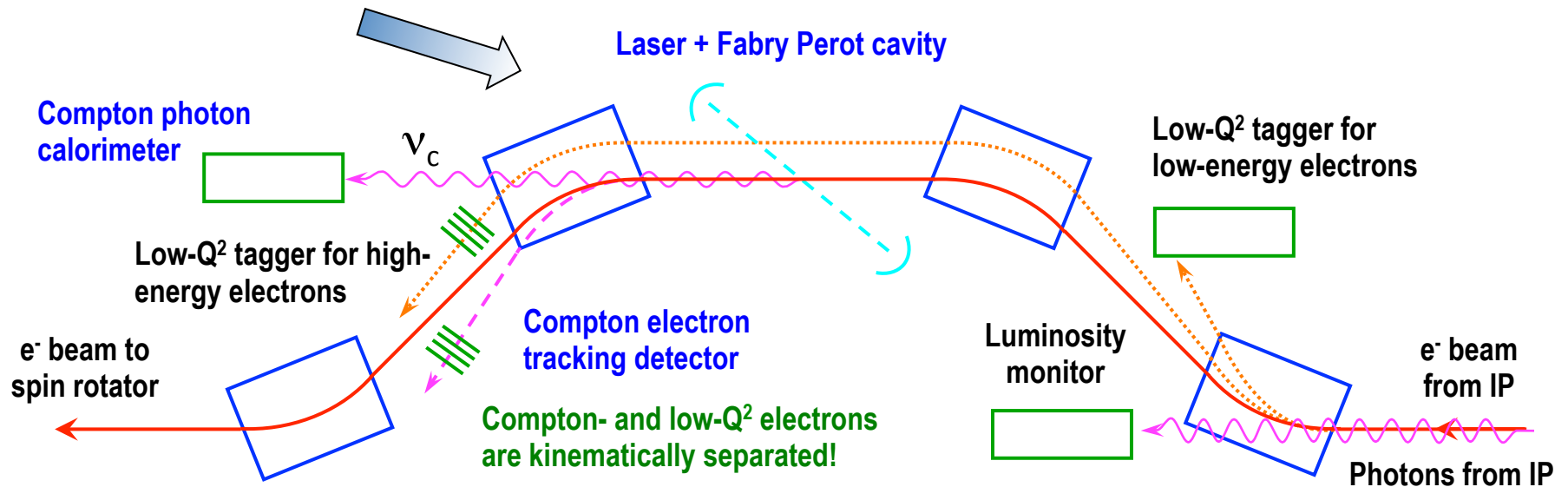
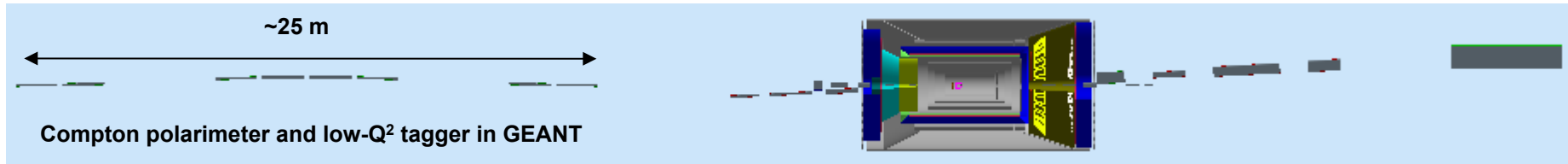
Electron polarimetry

- Experience from HERA: uncertainty $> 1\%$
 - Limited to detection of Compton photon only
 - Accelerator limitations (non-colliding bunches)
- Experience from JLab and SLAC
 - SLD at SLAC reached 0.5% detecting the Compton *electron*
 - Compton polarimeters in Halls A and C at JLab reach $\sim 1\%$ detecting both the photon *and* the electron for cross check

Laser at Chicane center ensures that polarization is identical to IP



Polarimetry options at the two IPs



- One IP (which one?) will have larger version of the JLab Compton chicane
 - Detection of both electron and photon, the latter with low synchrotron background
- Second IP will have a similar chicane optimized for electron detection
 - Goal is to push the uncertainty of the polarimeter towards what SLAC achieved